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To The Climate Action Team, Cap-and-Trade Subgroup

Commentary on the Climate Action Team Report to the Governor and Legislature (Dec. 8, 2005 draft)

Overview

My comments relate to the proposed public goods charge (Section 7.3), fee-based options (Section 7.4), the economic assessment (Section 8), and cap and trade (Section 6); and I have organized my commentary into the following topic headings:

(1) Provide quantification of the benefits of public goods charges.

(2) Model the economic potential of a public goods charge for transportation fuels, considering alternative expenditure scenarios.

(3) Resolve the policy inconsistency in recommendations relating to the public goods charge and fee-based options.

(4) Model the economic potential of an REP policy in the energy sector.[1]

(5) Reevaluate the policy basis of cap and trade from the standpoint of "environmental effectiveness".

(1) Provide quantification of the benefits of public goods charges.

The draft report states the following in Section 7.3,

> Californians benefit from building and appliance energy efficiency programs funded with the public goods charges on electricity and natural gas that provide a net saving of more than $1,000 per

[1] Recommendation 4 reiterates comments that I have previously made to the Climate Change Advisory Committee, documented in pages 291-299 of the July 11, 2005 meeting transcript: http://www.energy.ca.gov/2005_energypolicy/documents/2005-07-11+12_workshop/2005-07-11_TRANSCRIPT.PDF (My corresponding written comments to the CCAC are archived as Docket Log No. 34704, dated 06/20/2005, which I also forwarded to the CAT on Sept. 6.)

> household annually. … A public goods charge on petroleum would be a very effective, fair, and efficient means to reduce climate change emissions from the transportation sector and mitigate these damaging consequences to our environment and our economy. … If implemented in parity with existing public goods charges on electricity production, it would be equivalent to 2.57 ¢ per gallon of gasoline or diesel at the wholesale level.

These statements could be considerably strengthened by providing a reference citation or some quantification of the demonstrated benefits of prior programs and the potential benefits of the proposed charge. What has been the per-household cost of prior charges, and approximately what proportion of the cited $1000 savings can be attributed to the charges? Has the return-on-investment of such charges (both economic and environmental) been quantified? What specific applications are envisioned for the transportation charge, and can similar performance metrics be projected for the transportation sector? Clear quantification of the demonstrated and anticipated benefits of public goods charges would help allay concerns and engender political support for the proposal.

(2) Model the economic potential of a public goods charge for transportation fuels, considering alternative expenditure scenarios.

Public goods charges could be effectively applied to catalyze and support the development of pre-competitive emission control technologies and bring them to the point of commercialization. In addition, once they reach the threshold of commercial viability, a direct production subsidy for such technologies could be instrumental in overcoming market barriers and accelerating their early commercial deployment.

The economic modeling effort could include an analysis of the public goods charge, considering as limiting cases both types of expenditure. In one scenario, the revenue from a charge on transportation fuels would be applied entirely to support research and development, and in a second scenario the expenditure would be focused on subsidizing commercial production of renewable fuels.

The market would respond to the charge in two ways under the R&D scenario. First, the charge would immediately induce some marginal reduction in emissions based on the price elasticity of petroleum demand. Secondly, and more significantly, the R&D expenditure would provide longer-term environmental and economic benefits, which could be roughly estimated based on specific technology investment scenarios. (Such projections may be highly speculative, but past experience with similar programs could help bracket the range of possibilities.)

Under the commercial subsidy scenario a public goods charge on transportation fuels would be applied to directly subsidize low-carbon fuels (e.g., cellulose ethanol), making the policy revenue-neutral within the transportation fuel sector. For example, if 1% of petroleum consumption is effectively zero-carbon (taking into account upstream GHG emissions in fuel production), then a $0.01/gal charge would support a $0.99/gal net subsidy on carbon-neutral fuel. The charge-induced $1.00/gal cost difference would create a strong market incentive in favor of renewable fuels. Moreover, the market response would be further magnified by the relatively high cross-price elasticity of demand for fossil fuel versus renewable fuel (i.e., consumers will more readily switch fuel than reduce consumption).

As renewable fuels gain market share, the subsidy would diminish, e.g., at 10% penetration a $0.01/gal charge would only support a $0.09/gal net subsidy. At that point renewable fuels may have gained sufficient economies of scale that they do not need much of a subsidy, but in order to maintain the pace of decarbonization at the highest practicable level, the charge could be automatically adjusted to maintain the $1.00/gal cost differential. For example, with renewable fuels at 10% market penetration, the charge would be $0.10/gal and the net subsidy would be $0.90/gal. However, consumers would not likely see price variations of nearly this magnitude because fuels are blended, and because market competition would tend to force a levelizing of retail prices. The charge would mainly impact fuel producers. (In effect, the charge would induce a market-driven reallocation of the petroleum industry's windfall profits into renewable fuel production.)

(3) Resolve the policy inconsistency in recommendations relating to the public goods charge and fee-based options.

The CAT strongly recommends a public goods charge, which is a type of fee-based option, but the draft report paradoxically does not recommend fee-based options because they "cannot guarantee emission reductions" (Section 7.4). This is not a valid or well-reasoned policy rationale. It could be argued equally well that cap and trade should not be considered at this time because it cannot guarantee cost acceptability, which political institutions value more highly than guaranteed emission reductions. The draft report recognizes (in Section 6.1.A) that a viable cap and trade system may require a "safety valve", which forfeits the guarantee of emission reductions in favor of cost acceptability (i.e., costs are capped, but the emissions "cap" becomes a non-binding target). Any policy that "guarantees" meaningful and adequate emission reductions will provide no guarantee of cost acceptability and its environmental objectives will have to be compromised in order to gain political acceptance.

In formulating its policy recommendations, the CAT should look beyond academic dogma and consider how policies operate in the real world. Public goods charges represent one real-world, fee-based option with demonstrated energy efficiency benefits. Although such charges do not "guarantee emission reductions", a significant reduction from business-as-usual is a good start, and their high economic payback may indicate that substantially greater reductions could be achievable if such policies were expanded, or if similar alternative policies were adopted, in both the energy and transportation sectors.

(4) Model the economic potential of an REP policy in the energy sector.

Another real-world, fee-based policy option with a demonstrated track record is exemplified by the NO_x charge under Sweden's Acid Rain program. The charge was legislated in 1990, with the intention of achieving a 35% reduction in NO_x emissions from stationary combustion sources by 1995. The legislation employed a "Refunded Emission Payment" (REP) system (i.e., charges are levied on NO_x emissions and are refunded in proportion to energy production).[2] The program is revenue-neutral and does not impose any emission caps, standards or timetables, but it nevertheless induced a 60% reduction in specific NO_x emissions from regulated plants between 1990 and 1995. The total reduction, with demand growth, was 50%. (By contrast, had a cap-and-trade system been employed, it would not have motivated emissions reduction greater than the 35% target.)

One aspects of Sweden's REP system is especially relevant to the Climate Action Team's policy considerations. In this instance the policy's lack of "guaranteed emission reductions" resulted in *greater*-than-anticipated reductions, not less. The NO_x emissions charge (SEK 40/kg- NO_x, or roughly $2.50/lb- NO_x) was based on overestimated technology costs, so the charge was set at a higher rate than it might have been if costs were more accurately projected, resulting in greater emission reductions. (By contrast, the effectiveness of cap and trade is diminished by cost overestimation because emission caps must be set high enough to accommodate cost uncertainty.) But even with the emissions target overshoot, the program's economic cost has been estimated at just $0.0004/kWh, well within the bounds of political acceptability.[3]

Sweden adopted the REP approach because it faced a particular dilemma with NO_x regulation. Due to the high expense of NO_x emissions monitoring equipment it was only feasible to regulate NO_x from large combustion units with at least 50 GWh annual generation capacity. Although Sweden employed an emissions tax

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[2] Isaksson, L., Sterner, S., 2005. Refunded emission payments theory, distribution of costs, and Swedish experience of NOx abatement. to be published in Ecological Economics; available online 11 May 2005: http://www.sciencedirect.com/science/journal/09218009
document identifier: doi:10.1016/j.ecolecon.2005.03.008 (http://dx.doi.org).

[3] Wolff, G.H., 2000. When Will Business Want Environmental Taxes? Published by Redefining Progress. http://www.redefiningprogress.org/publications/pdf/etr_business.pdf

for SO_2, that approach would not have worked for NO_x because a high tax applied exclusively to large plants would have been unfair and created perverse incentives to downsize power plants. Moreover, the high tax level under consideration would have put Swedish firms at a competitive disadvantage relative to foreign producers, and in any case would have been politically unviable. The REP scheme was devised to circumvent these difficulties.

As it turned out, the cost of monitoring equipment came down so that the program could be expanded to include smaller units with at least 25 GWh generating capacity in 1996 and 1997. But during the first several years of the program, when the initial large reduction in emissions occurred, the regulated firms were competing not only against foreign producers, but also against local, unregulated small-capacity producers. Nevertheless, due to the REP system's revenue neutrality it encountered little political opposition, and the program has achieved NO_x emission reduction levels far exceeding that of the US and other industrial countries.

The fundamental policy rationale for the REP-type regulatory approach is that (1) it imposes a guaranteed limit on regulation-induced costs, and (2) rather than merely capping emissions at unsustainable levels, it creates market incentives to minimize emissions to the extent possible within defined limits of cost acceptability. The empirical evidence from the Swedish NO_x program should be combined with economic analysis to evaluate the potential of this promising regulatory approach for GHG emissions reduction – for example, by application of REPs to load-serving entities in California's electric power sector.

(5) Reevaluate the policy basis of cap and trade from the standpoint of "environmental effectiveness".

Although the Cap and Trade Subgroup's responsibilities and policy recommendations are not limited to the narrow scope of cap and trade, it has demonstrated a clear preference for, and bias in favor of, cap and trade, to the exclusion of alternative "fee-based" policy approaches. The CAT draft report does not articulate a cohesive policy rationale for this preference. The following comments points out some of the key policy deficiencies of cap and trade that should be reasonably considered and addressed in the Climate Action Team's policy recommendations.

The basic policy rationale for cap and trade is that (1) it establishes a firm emissions limit (the cap) and (2) it reduces compliance costs (via trading). But in the context of economic and political realities, the first objective is unachievable and the second objective is inadequate.

Regarding the "firm emission limit", cap and trade can only guarantee attainment of environmental sustainability objectives if the emission cap limit is actually set at a sustainable level. Moreover, irrespective of what cap level is chosen, there is no guarantee that the cap will be achieved unless political and regulatory institutions are able and willing to enforce the cap at any cost. Neither of these conditions holds true in practice. For example, the governor's mid-term (2010 and 2020) emission targets for California, unlike the 80% reduction target for 2050, are determined by economic and political viability considerations and not by environmental requirements. The U.S. Acid Rain program's emission cap for SO_2 is about a factor of five higher than the environmental sustainability limit.[4] And it has been estimated that the Kyoto Protocol's currently-defined emission limits (with U.S. participation) would only reduce projected temperature increases from global warming by about 5%.[5] The Kyoto signatories' current emission trends further underscore the vacuity of "guaranteed emission reductions": Two thirds of EU countries are set to miss their Kyoto commitments[6], and the EU ETS does not have the policing authority to guarantee emission reductions. And while Canada is formally committed to a 6% reduction from 1990, its emissions have already risen to 32% above its Kyoto target[7]. (Even with its Kyoto commitment Canada is moving ahead with tar sands development, which will result in massive additional GHG emissions.[8])

Although cap and trade functions to reduce costs, it provides no guarantee that costs will be reduced to acceptable levels. Significant GHG reductions can be attained at acceptable cost (and even negative cost, in some cases), but nevertheless, the combination of cost uncertainty and inflexible caps generally makes it politically infeasible to set adequately stringent emission caps or to secure broad-based support for emission targets. For example, Kyoto's cap-and-trade framework makes it infeasible to impose binding regulatory commitments on non-industrialized countries (China and India, in particular), even though the near-term ancillary benefits of significant emissions reduction (fuel and energy savings, plus health-and-safety benefits) can potentially offset regulatory costs[9].

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[4] Baum, E., 2001. Unfinished Business: Why the Acid Rain Problem is Not Solved. Clean Air Task Force http://cta.policy.net/proactive/newsroom/release.vtml?id=21360, http://cta.policy.net/relatives/18480.pdf.

[5] T. M. L. Wigley, "The Kyoto Protocol: CO2, CH4 and climate implications," in Geophysical Research Letters, Vol. 25, No. 13, pp. 2285-2288, 1998. http://www.agu.org/journals/gl/gl9813/gl_25_13.html.

[6] "Two thirds of EU countries set to miss Kyoto commitments," Institute for Public Policy Research, Dec. 27, 2005.
http://www.ippr.org.uk/pressreleases/?id=1863,
http://www.ippr.org.uk/uploadedFiles/pressreleases/trafficlights.pdf,

[7] "Canadian Environmental Sustainability Indicators," published by Statistics Canada, Dec., 2005. http://www.statcan.ca/english/freepub/16-251-XIE/16-251-XIE2005000.pdf.

[8] "Canada, the US, and the Tar Sands" by MacDonald Stainsby, Dec. 28, 2005. http://www.zmag.org/content/showarticle.cfm?SectionID=102&ItemID=9415

[9] "No Reason to Wait: The Benefits of Greenhouse Gas Reduction in São Paulo and California," published by the Hewlett Foundation, Dec., 2005.
http://www.climatechange.ca.gov/documents/GOLDEMBERG_LLOYD_2005-12-02.PDF.

In 1997 the U.S. Senate unanimously rejected the Kyoto Protocol[10] because developing countries are exempt from binding targets, and because of the perception that the economic costs of Kyoto would harm the U.S. economy. A much more modest legislative proposal for a domestic U.S. cap-and-trade system was introduced by Senators McCain and Lieberman in 2003[11], but it has not yet been able to overcome cost concerns and garner majority support, even though its initial emission targets have been considerably weakened. In December 2005 a number of Northeastern states enacted an even more limited regional cap-and-trade initiative (RGGI), but two states that were initially part of the pact (Rhode Island and Massachusetts) pulled out at the last minute due to cost concerns.[12]

Considering the pervasive and deep-rooted dependence of industrial economies on fossil fuels, a reduction of GHG emissions on the order of 80% will entail a fundamental restructuring of the global economy's technology base on the scale of the industrial revolution, and regulatory policies that are capable of inducing changes of this scale could be the dominating economic influence shaping the 21st-century economy. The CAT draft report propounds a fanciful vision of how the transition to a low-carbon economy will be effected by consolidating local and regional cap-and-trade programs into a national or global system in which regulators would set aggregate emission caps, ration emission quotas, and progressively "ratchet down" the caps until the 80% reduction goal (for California) is attained. Empirical experience and policy considerations provide no evidence that cap and trade is capable of motivating free market economies and democratic political institutions to make anywhere near the scale of emissions reduction required for climate stabilization. For example, the precedent-setting U.S. Acid Rain program has only been able to reduce SO_2 emissions to within about a factor of five of the environmentally sustainable level, even though its regulatory costs are far below original expectations[13].

The Acid Rain program's inadequate emissions cap is not simply the result of political intransigence – it is a consequence of the cap-and-trade system's inflexibility and reliance on uncertain predictive assumptions, which made it politically infeasible to establish a more stringent cap. The CAT draft report suggests that a GHG emissions cap could be gradually "phased down over time",

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[10] 105th Congress, 1st Session, S. Res. 98 (Byrd-Hagel Resolution)

[11] 108th Congress, 1st Session, S. 139 (Climate Stewardship Act of 2003)

[12] "7 states sign emissions pact," The Boston Globe, December 21, 2005
http://www.boston.com/news/local/massachusetts/articles/2005/12/21/7_states_sign_emissions_pact/
http://rggi.org/

[13] Burtraw, C., Palmer, K., 2003. The Paparazzi take a look at a living legend: the SO2 cap-and-trade program for power plants in the United States. Discussion Paper 03-15, Resources for the Future. http://www.rff.org/Documents/RFF-DP-03-15.pdf.

which might make the system more flexible and less dependent on long-range predictive assumptions. This is analogous to the approach taken by the Kyoto Protocol, which currently only applies to the 2008-2012 commitment period, deferring discussions of deeper cuts to future negotiations. However, a weakness of Kyoto is the uncertainty regarding future commitments, which deters industry from making long-term investments in large-scale alternative energy installations and new energy technologies. A “phase-down” policy approach that makes only short-term, incremental commitments can only efficiently induce short-term investments in incremental technologies, and significantly deeper future emission cuts may not be politically or economically viable because the fundamental energy infrastructure investments necessary to support such targets will not have been made. A cap phase-down schedule may have to be committed to over a long time horizon (e.g. decades) to motivate the kind of technology and infrastructure investments that would be required to achieve long-term GHG reductions on the order of 80%. (For example, an absolute cap reduction equivalent to approximately 2% of 2005 emissions, applied annually over the next 45 years, would achieve the 80% target.) However, predictive uncertainty over such a time scale would make it impossible to know with any degree of certitude how to schedule the cap reductions to optimally balance environmental objectives against cost acceptability constraints.

The dilemma of cap and trade is that such regulatory instruments are constructed to achieve policy objectives that conflict with legislative policy requirements. Cap and trade gives highest priority to keeping emissions within a fixed cap limit; and as a second priority, it reduces costs to the extent possible subject to the emissions constraint. Conversely, political realities require that legislative policy give highest priority to keeping costs within an acceptable limit; and as a second priority, emissions are to be reduced to the extent possible within the cost constraint. Trying to use an emission cap to hit a cost target is inefficient and environmentally ineffective because costs cannot be reliably predicted in the context of rapidly evolving technologies and volatile markets. (This policy conflict is also characteristic of other types of quantity-constrained policy instruments such as emission standards. Cost-constrained policy instruments such as REPs would not be affected to the same degree by predictive uncertainty because they exert direct regulatory control over costs.)

Cap and trade instruments can, to some extent, be adapted to remedy the policy incompatibility and improve political acceptability – for example, by employing a safety valve or banking, or by focusing on regulatory options that provide maximal cost savings. Such variations do not, however, address the core issue that cap and trade is fundamentally designed to achieve objectives at variance with political constraints, and they do not represent an efficient or environmentally effective adaptation to those constraints. For example, a safety valve is typically employed simply to limit costs and mitigate cost volatility, and not to improve environmental effectiveness (e.g. Senator Bingaman’s proposal, based on NCEP recommendations, employs a safety valve but its targets are no more stringent than the McCain-Lieberman proposal, which does not have a safety valve[14]). Banking would not provide much leverage to protect industry from trading price spikes unless emission caps are excessively lenient (as they are in the Acid Rain program). A policy focus on achieving positive cost savings conflicts with the objective of achieving maximal emissions reduction and provides no guarantee that such savings will be realized.

The draft report's policy recommendations are grounded on the concept of "cost effectiveness" (e.g., this is the primary evaluation criterion of the economics assessment). But the report does not give equal consideration to "environmental effectiveness" and does not adequately reconcile the competing goals of cost minimization and emissions minimization.

A policy is generally considered to be "cost-effective" if it achieves a given emissions limit at the lowest possible cost.[15] (The term is sometimes used in the different sense of "guaranteeing cost acceptability" – as in the context of AB 1493, which mandates "maximum feasible and cost-effective reduction of greenhouse gas emissions from motor vehicles"[16]. But the former sense is more applicable to cap and trade.)

A policy can be analogously defined to be "environmentally-effective" if it achieves the lowest possible emissions level within a given cost limit. (The term is commonly used in the different sense of "guaranteeing environmental adequacy", but the former definition is more relevant because a policy that does not control costs cannot generally garner sufficient political support for environmentally adequate emission targets.)

In a narrow sense, the concepts of cost effectiveness and environmental effectiveness, as defined above, are equivalent (i.e., minimizing dollars spent per ton of emissions reduced is equivalent to maximizing tons of emissions reduced per dollar spent). The essential difference between the two concepts is in what is considered to be "given": the emissions limit, or the cost limit; and this difference affects the regulatory policy response to unforeseen changes in technology or economic conditions. As emissions technology advances a policy that is focused solely on cost effectiveness will motivate industry to reduce costs without further reducing emissions, even if the emissions level is far above the sustainable limit

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[14] "Comparison of Climate Policy Proposals," Pew Center on Global Climate Change http://www.pewclimate.org/policy_center/analyses/csia_ceia_comparison.cfm.

[15] Aldy, Joseph E., Richard Baron, and Laurence Tubiana. 2003. "Addressing Cost: The Political Economy of Climate Change." In: Beyond Kyoto: Advancing the International Effort Against Climate Change, Pew Center on Global Climate Change, Arlington, VA.
http://www.pewclimate.org/docUploads/Beyond%20Kyoto%2Epdf

[16] Assembly Bill 1493 (Pavley), SEC. 3(a)
http://www.arb.ca.gov/cc/ab1493.pdf

and costs are both well below the level of investment necessary to achieve climate stability and well within the limit of political acceptability. By contrast, a policy that is focused on environmental effectiveness will induce industry to further reduce emissions while holding costs within an acceptable limit.

The “environmental effectiveness” criterion is more compatible with both the environmental objective of minimizing emissions and the economic objective of strictly limiting costs. Regulatory policy options such as cap and trade should be evaluated in relation to this criterion, realistically taking into account the regulatory and market response to predictive uncertainty and considering how competitive markets would respond to unanticipated economic conditions and technology advances. Economic analyses should consider an ensemble of possible market and technology scenarios, distinguishing between predictive expectations (upon which regulations are based) and actual conditions. Within this analysis framework, policies should be rated in terms of their ability to both control costs and achieve maximum emissions reduction per investment dollar.